SUPPLEMENT.

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Original Correspondence.

THE BRITANNIA IRONWORKS, BEDFORD.

Travellers going from London to the North of England by the Midland Railway cannot fail to have noticed the handsome pile of buildings close to the Bedford station, and to perceive that they belong to Messrs. James and Frederick Howard, the celebrated agricultural implement makers, for their name and business stand out in bold and tasteful relief along the extent of that portion of the works facing the railway. Pleasing, however, as the works really are as seen from the window of the carriage whilst moving along the rails, with their well arranged and effective display of fancy bricks and stone mouldings, yet it is on a nearer inspection that one is struck with the good taste and perfect arrangement which appear to permeate even the most minute details in connection with the large buildings of the Britannia Ironworks. There is certainly no reason why ironworks should be built on a dungeon model, and this view has evidently been adopted by Messrs. Howard, for more commodious, comfortable, and graceful offices and buildings in connection with any branch of the iron trade we do not believe are to be found in the kingdom. The elegant offices are in the modern style of Italian architecture, and have a most pleasing appearance, as the ground around is kept in a high state of order, everything having a place.

Over the principal entrance is a beautiful figure of Britannia, and a large sheaf of wheat, with the appropriate motto—"He that tilleth his land shall have plenty of bread." Independently of the works, they are of themselves, and on account of the systematic arrangements carried on in them, well worthy of a visit. No circumlocution office here. No mystifying of accounts and multiplying of accountants. From the door-step to the iron safes there is the same easy and artistic proportion of parts and adaptation of means to an end. "Let all things be done decently and in order," seems to be the ruling motto here. Separate offices for separate clerks, with private access for each, give an amount of effective elbow-room not often met with. Then the waiting-room, so well furnished and so elegantly finished, possesses attractions that may take the tedium from delay. A good selection of engineering and agricultural books and newspapers will be found ready at hand, as well as a copy of the Bible. The newspapers are all stored in lettered pigeon-holes of suitable size till the end of the year, and then take their ranks with the bound volumes which preceded them.

In a glass case were some 60 or 70 medals, gold, silver, and bronze, which had been gained by the firm not only for the implements, but also for cattle and agricultural produce, for Messrs. Howard farm about 600 acres of land, all the work in connection therewith being done by steam and machinery.

The works stand on nearly 20 acres of ground, and the foundry, forge, fitting, and other work places are all lofty, well enclosed, and efficiently ventilated, everything calculated to ensure the health and comfort of the workmen having evidently been carefully studied and carried out. On expressing a desire to see the works it was at once complied with, and a gentleman undertook the task of guiding us through the works, and he did so with evident pleasure.

One of the first places to which our steps were directed was that in which the tubular boilers patented by the firm were being made. The demand for them is now increasing, and the workmen are kept very busily engaged in their production. They are adapted for either locomotive, marine, or stationary ordinary engines, and at least 20 of them are now at work at the well-known establishment of Messrs. Crossley, of Halifax, for whom others are now being made. The boilers consist of a strong wrought-iron bottom tube, with a series of tubes screwed into it at right angles, there being no bolts or rivets, and no joint is exposed to the action of the fire. There is a much greater range of water level in them than in the ordinary boiler, whilst the pressure that can be obtained is really immense, the whole of the steam-pipes and connections being tested to a pressure of 500 lbs. Another great advantage attending the Messrs. Howard's patent boiler is that in the event of any one part giving way only that particular tube would be affected, so that an explosion would be almost harmless in comparison with the death and destruction caused by the giving way of one of the ordinary boilers. Some other advantages of the Howard safety boiler are economy of fuel, consumption of smoke, circulation of water, simplicity of parts, facility of repairs, and durability, portability, &c. Whilst inspecting this very interesting department, we were shown a boiler that was being got ready for a steam-vessel. These boilers are being sent out to all parts of the world, and the demand for them at present is fully equal to the power of production.

The foundry is a large and admirably fitted up building, lofty, with plenty of light, 250 ft. in length by 140 ft. in breadth, the roof being in two spans. The building is quite a model of what a foundry ought to be, and is probably, taken altogether, not to be excelled, if equalled, in the country. There are several tramways and turntables, so that the metal can be conveyed rapidly from one part of the building to another. Here moulding of every description was being proceeded with, the melting furnaces being well arranged, the metal and fuel being raised by a hoist. Immense numbers of ploughshares are made here; they are chilled by a rather peculiar process, and to which our attention was specially called. A man and a boy attend to each mould, and as soon as the molten metal is poured in, by means of a perforated tube, a jet of water comes in contact with it below the mould—the water supply extending at one and the same time to the entire range of moulds, there being about a dozen in a row. By that means the bottom part is well hardened; when in full operation as many as 500 dozen of chilled ploughshares are turned out in a day.

The malleable furnaces naturally claim attention, and also the hardening or annealing process, which takes some eight or nine days from first to last. This is analogous to the manufacture of steel, and, in fact, the iron so produced has many kindred properties to steel. It is beautifully white, very light, and very strong—twisting before breaking—and is used for reaper fingers, plough bodies, steam-plough frames, and articles which need to be light, while having to meet a heavy strain.

The Messrs. Howard have done much in saving manual labour, and the least of which is the fine moulding machinery which they have adopted, and by which one or two persons can turn out as much work as five times the number by the usual system. By the side of the foundry are the pattern stores, with their vast and varied models of what was and is used; whilst in another place adjacent is a small mill, driven by engine power, for grinding the sand for the use of the moulders.

The forge department is a large and well-arranged building, having steam-hammers and all the necessary requisites for turning out an immense amount of work. There were upwards of 70 fires going whilst we were there, yet the place was pleasantly cool. There is a steam-driven blast revolving from a fan 3000 times a minute, which supplies the necessary air for all the fires. The workmen were actively engaged in putting in the ends of the tubes for the patent boilers, welding the ends of plough-heads, and similar work.

The fitting department is of similar dimensions to several of the other branches, with plenty of space for working in. Here every description of goods for which the firm is celebrated is put together and placed ready for being sent off, there being lines of rails to convey the goods to the outside. Steam, it may be said, is conveyed underground, and through a vast range of buildings, three of Messrs. Howard's patent tubular boilers, however, being found quite sufficient for the purpose. There is also an extensive turning-shop, the lathes being driven by the main engine, which is of 80-horse power. Another important branch of manufacture, wire-rope making, is carried on at the works, the rope being used for steam-ploughing machinery. In the carpenters' shop there are circular saws and other scientific appliances for economising labour, the necessary power being obtained from the boiler above alluded to, the three boilers being found sufficient for the immense extent of ground in which steam-power is used. One of the boilers, in which the pressure of steam is 100 lbs. to the square inch, is supplied with heat from the waste gases of a plate-furnace.

The store-rooms are of vast proportions, and contain all the material manufactured for the machinery made by the firm, all being methodically arranged. There were steel and wrought and cast iron goods, and every description of fittings, large and small.

The painting department is quite in keeping, so far as proportions are concerned, with the other working departments. All the machinery being packed is here coloured and dried. The room is not so large as some others, but some idea of its extent may be gathered when we state that on Whit Tuesdays, on the occasion of the holding of the annual juvenile Bible meeting, some 3000 or 4000 young people and adults assemble inside its walls.

We now come to the forwarding department, or railway station, which is adjacent to the fitting and painting shops, so that it will be seen no plough or part of a plough has to go over the same ground twice. The floor of the forwarding department is paved with irregularly-shaped blocks of wood, making a pleasant, soft, and springy floor, on which fractures or accidents to castings would not be likely to happen. Here the goods for export are packed, the shares and smaller articles going in barrels, and the larger parts in oblong boxes or cases. Many thousand dozens of ploughshares are sent out every month; and several thousand truck-loads of goods arrive at and leave the works' station in the course of the year. Both the London and North-Western and the Midland lines are connected with and literally encircle the establishment; the carrying is, therefore, managed with the utmost convenience and dispatch.

The vast quantity of machinery stacked in the yard is worth a passing notice. Here are arranged ploughs of almost every description, reapers, cultivators, mowers, and vast piles of pig-iron—all in order—thousands of tons of material, but everything in its place.

On leaving the building we had pointed out a Wellingtonia gigantea in a flourishing state, which had been planted by Garibaldi when he visited the works on the occasion of his memorable visit to England, and saw our country homes, and the scientific methods adopted in the tilling of our land. At no place in England could those means be seen to greater advantage than at the farm of Messrs. Howard. On passing by the workmen's entrance our attention was attracted by a fine figure of Ceres, holding a wreath, on the pedestal being the appropriate quotation—"Whatsoever thy hand findeth to do, do it with thy might."

As before stated, everything is done to ensure the comfort of the workmen, of whom about 700 are employed; and as a rather unusual thing, we may state that on hearing a bell ring at eleven o'clock we were informed that it was for the men to partake of luncheon, for which ten minutes were allowed. There are no schools in connection with the works, Bedford being in an exceptional state with regard to education, the wealthy Harpur Charity providing instruction of the best description to the children of the inhabitants of the town, as well as affording other advantages to those who once come within its fold.

The works have attracted large numbers of the most distinguished agriculturists of the United Kingdom and of Europe to visit them, as well as celebrities from more distant parts of the world. For our part, we may say that these works are well worth visiting by those who take an interest in agricultural machinery.

STEAM-BOILER FIRING.—Mr. G. FISCHER, Brandenburgh, proposes to dispense with the ordinary furnaces below the boiler, or those placed in internal flues, and employs in their stead a number of vertical firing-pipes, leading to flues used as fire-chambers or canals, the pipes being either passed through the boiler or formed at the sides, and at the top of each pipe there is a movable lid, with one or more air-holes. The flues are provided at each end with a door, and at one end of each flue there is a small grate or fire-place, in which small fires are made at the commencement of operations, and where the flues communicate with each other there are grids to separate the gases, and cause their combustion.

STEAM-ENGINES.—By the invention of Messrs. T. PATON and T. WINDER, Liverpool, two or more vertical cylinders, with valves and accessories, and reciprocating pistons and connections, are fitted with trunks to their under surfaces, and these pass through the lower ends of the cylinders. The air-pumps are fitted with cisterns adapted to be acted upon by steam on their upper surfaces, and are placed alongside the steam-cylinder. One air-pump may be used, but two are preferable. The condenser is placed alongside the air-pumps. Steam at high pressure is admitted into the annular space in each cylinder around the trunk where it, assisted by the pressure of the atmosphere on the trunk, moves the piston in one direction; the principal part of the same steam is then allowed to pass on to the top of the same piston, but a portion is conveyed on to the top of the air-pump piston. The expansive energy of the steam acting on the top of the piston and on top of the air-pump piston serves to move the piston in the opposite direction for the return stroke. The steam is afterwards allowed to exhaust into the condenser.

STEAM-CARRIAGES.—Messrs. PIRET, Paris, propose that the steam-carriage is provided with two steam-cylinders, disposed horizontally in the same plane with the axis of the driving wheels, and firmly secured to two horizontal frames carried at the one end on the rear axle, and at the other on the fore carriage. The frames also support the piston guides and cross-bar, on which are mounted the slides, rods, and levers of the reversing gear. The motion of the pistons is transmitted by the aid of connecting-rods to the discs mounted on a shaft turning in bearings, which shaft also carries the eccentrics communicating motion to the slide valve.

COLLIERIES IN NORTHUMBERLAND, THEIR WORKINGS AND MACHINERY—No. III.

The four collieries of Killingworth, Gosforth, Seaton Burn, and Dinnington winning, form another section of the mineral property of Messrs. John Bowes, C. M. Palmer, and Company, of which Mr. S. C. Crone is viewer. The area of mineral property belonging to, and leased by, the firm under this section is 8242 acres. Killingworth Colliery is well known as being associated with the labours of George Stephenson in the invention of the miners' lamp which bears his name. He was for many years a resident at Killingworth, first as a breaksman, and afterwards as engineer over the colliery works. The colliery was then under the management of Nicholas Wood, and experiments on the nature of the gases found in coal mines were conjointly made by them, which led to the introduction of Stephenson's lamp, in 1815. His contemporaries—Sir H. Davy and Dr. Clanny—also produced their lamps about the same time, the result of their investigations on the nature of flame. Each of the three classes of lamp has its distinctive features, and they are at the present day the most generally used in coal mines; but, with the exception of the Stephenson lamp, they are by no means to be considered as safe lamps under extraordinary circumstances.

The Killingworth and Gosforth properties are remarkable as being situated on the line of the great 90 fm. dyke; the name indicates the throw of the dyke to the west at Tynedale Fell, where it was first observed; but its throw at Gosforth is ascertained to be not less than 170 fms. down to the north. This dislocation, having occurred subsequent to the deposition of the beds of coal, causes some difficulty in accounting for the arbitrary changes in the quality of coal on the respective sides of the dyke. The High Main seam is not altered in its characteristics to the north and south of it. At Gosforth the Low Main seam produces steam coal on the south side of the dyke, but partaking more of the character of house coal on the north side; as this seam has only recently been reached, and not explored to any extent, the change probably is merely a local one. The reverse of this holds good to the eastward; the seams below the High Main seam north of the dyke produce steam coal, those on the south side second-class house coal. In the early period of the working of Killingworth Colliery miners' lamps were unknown. One pit was used for the operations of raising coal, pumping water, and for the inlet and outlet of air; the quantity of air circulated in the mine was small compared to what is required by modern practice. It does not excite surprise now to learn that explosions were frequently occurring in the early periods in mines where gas, even in moderate quantity, was thrown off. After the introduction of lamps, in 1815, accidents were still taking place, owing probably to the use of candles in mines, and to their defective ventilation. Happily, these accidents are now of rare occurrence in the northern coal field, since their causes have been enquired into, and have become better understood. The safety of coal mines is found to be dependent on the workings being scientifically arranged, on copious streams of air put in circulation through every part, and rules for the guidance of workmen and overlookers strictly attended to—these combined, have produced a much improved state of things, the result of years of dear-bought experience, and of a great amount of scientific knowledge brought to bear on the subject.

KILLINGWORTH COLLIERY.—The present coal pit, or Westmoor Pit, was commenced sinking in the year 1800, and coal working in the year 1803. It is 14½ feet in diameter to the High Main seam, 114 fms. in depth; 30 fms. of wood curb-tubbing was inserted while it was being sunk, which is still good and effective. The pit to this depth is divided into four quarters by wood brattice: one quarter is for the pumps; the B pit quarter is for raising coal from the High Main seam, this division being too small for the cages to pass, is enlarged at the middle for this purpose; the two other quarters are deepened by a pit sunk in each, 7 ft. in diameter, 60 fms. lower, the whole of the 60 fathoms in each pit is secured by cast-iron tubbing. From this depth—174 yards—a stone drift is driven across the measures, nearly level, 800 yards in length, which intersects the Low Main, Bensham, Yard, and High Main seams. This drift was necessitated, owing to the bending down southward of the measures for about 1000 yards as the 90 fm. dyke is approached; commencing at 1 in. per yard at the pit, the dip increases to 8 inches per yard at the drift end, and to 16 in. per yard adjacent to the dyke. By this drift the dip part of the High Main seam has been brought out: the coal is supposed to be worked close up to the dyke, continuing good in quality, but water impeded the operations here; it was raised in tanks from the dip. The Yard seam is now got from the levels driven laterally from the drift. In the two quarters of the pit last named, called the A Pit, the Yard coal is now raised from the lower level, 174 fms., by a separate engine. The whole of the pit is downcast, the upcast being situated 1500 yards eastward, and is 90 fms. in depth.

The B Pit winding-engine has one 28-in. horizontal cylinder, 5-ft. stroke, direct-acting, two 12-ft. flat wire-rope drums, with fly-wheel, and foot-brake half around it. About 270 tons of coal per day is raised, in two-decked cages, two 6-cwt. tubs in each cage. Three plain boilers, 30 ft. by 5½ ft., supply this engine at 35 lbs. pressure, these are hand-fired, not covered; the boiler-feeder is a 4-in. inverted engine. A counterbalance-weight works in a staple at the back of the house.

The A Pit winding-engine has a 36-in. vertical cylinder, 7-ft. stroke, wrought-iron levers, 15 ft. flat-rope drums, fly-wheel and foot-brake; these are supported intermediately by wood framing. The engine raises about 240 tons per day, in four-decked cages, four 6-cwt. tubs in each cage. The counterbalance is a loaded wagon running on an incline.

The underground hauling-engine is placed at the top of the pit; it has two 30-in. horizontal cylinders, 5-ft. stroke, wheels in ratio of 1 to 1½; two drums on separate shafts, two slide carriages to each. The main rope drum is 12 ft. in diameter. With this drum the engine formerly hauled up the bank in the High Main, from the extreme dip workings near the dyke to the stone drift. This is now abandoned, and the engine, with a 10-ft. tail-rope drum added in front of the other, is now applied to hauling in and out on a plane in the High Main at the higher level; eight plain boilers, 30 by 5½ ft., covered with fire-brick, supply the A Pit and hauling-engines with

steam, at 42 lbs. pressure. The boiler-feeder for these is a 6-in. inverted engine, by Horsley.

The pumping-engine dates from the commencement of the colliery, and is now standing and worn out; it is a 54-in. double-acting beam condensing engine, 9-feet stroke; the front beam is a trussed wood beam, the back one is a plain wood beam. The engine raised water in four lifts, from the depth of 120 fms., each lift 30 fms. The first lift, 13-in. bucket, was worked by diagonal rod from the cylinder end and V-bob; the three upper ones, 12-in. buckets, were worked from the outer end of the main beam. Two plain boilers, one 25 by 6 ft., one 20 ft. by 6 ft., supplied the engine with steam at 7 lbs. pressure. Water is now raised by both winding-engines, in tanks, for eight hours each night.

The engine-plane in the High Main seam is 1800 yards in length, from the shaft to the return wheel; it proceeds north-west the greater part of that length, and afterwards north. The engine pulls this length in and out by main and tail ropes in seven or eight minutes, 30 tubs at once; the main rope at the top of the pit passes over an 8-ft. pulley, the tail-rope over a 6-ft. pulley; at the bottom of the pit both pulleys are 6 ft. in diameter; the ropes pass down the A Pit, and are not enclosed. About two-thirds of the B Pit drawing is brought out by the engine. The High Main seam is worked beyond the extremity of the engine-plane, from Gosforth property, in a panel consisting of 21 west bords, the wagon bord having eight bords north and twelve on the south of it. The cleavage is about north 20° west; the rise is 1 inch per yard northward; the pillars are made 29 yards by 20 yards, bords 4½, walls 2 yards in width. The Stephenson lamps are used solely here; powder is not used, wedging is substituted.

Section of the High Main seam in this panel:—

1.—Metal roof, inferior.		
2.—Coarse coal	0 ft.	9 in.
3.—Stone band	0	1½
4.—Good coal	3	10
5.—Coarse coal	0	8=5 ft. 4½ in.
6.—Shale mixed with coarse coal	2	6
7.—Crow coal	2	0
8.—Fire-clay, not used.		

The upper beds = 5 ft. 4½ in. only are worked. Nos. 2 and 5 are separated from the good coal; the latter is hard, and of excellent quality. The Yard seam is 3 ft. 7½ in. in thickness, including shale band of 2½ in. The pillars in this seam are made 29 by 20 yards, bords 5 and walls 2 yards in width. Lamps are used for lighting the mine. Powder is used for blasting the coal, but under strict regulations; the deputies alone are permitted to fire shots, first satisfying themselves that no gas is present, either in the working faces or in any workings near. This precaution is the more necessary, owing to the workings being driven to the rise of the seam, which is about 4 in. per yard; the explosive gas given off from the coal by its natural lightness hangs about the working faces, and is the more difficult to dislodge. The rules for use of the safety-lamps by the hewers are here rigidly enforced, not the slightest infringement of these rules is allowed. Section of the Bensham seam:—

1.—Coal	1 ft.	8½ in.
2.—Coarse coal	0	0½
3.—Coal	1	1
4.—Splint band	0	3
5.—Coal	1	6=4 ft. 7 in.

This seam is not worked, nor is it likely to be for some time to come. The Low Main measures 2 ft. 6 in. in thickness in the drift; it is not yet worked. The Beaumont, or Harvey, seam is bored to from the bottom of the small pit and found to be 3 ft. 6 in. in thickness; this seam usually produces gas and coking coal in the Wear district.

The air in circulation through the whole of the mines at the upper level is	25,000	cubic feet per minute.
„ at the lower level is	26,000	„ „
Total	51,000	„ „

Two furnaces, 8 ft. and 6 ft. in width respectively, heat the upcast column. Besides the hauling engine, there are six horses and fourteen small ponies employed in the conveyance of coal underground. The Killingworth workshops comprise smiths' shop, containing five fires blown by fan, joiners' and fitting shop (the latter contains five machines), these, with the fan and circular saws, are driven by a 15-in. vertical engine. Gas-works are erected near the pit.

GOSFORTH COLLIERY.—Two pits are sunk, 12 feet in diameter, 10 yards apart, 190 fathoms in depth. The sinking of these was commenced in the year 1824, and the working of coal in 1828. The High Main seam had previously been nearly exhausted on the south side of the 90 fathom dyke, for which several pits had been put down; the depth to this seam is 35 fathoms in the present pits, walling set in cement was inserted at this part of the pit for damming back the water accumulated in the old works; this has recently been replaced by cast-iron tubbing, no water is found below this. At the depth of 85 fathoms the Low Main seam is got, and is worked to the extent of 100 tons per day. It is understood the coal measures are not bent over on the south or rise side of the dyke, as they are on the north side. The Brockwell seam is intersected at the depth of 160 fms., not worked at present. From the depth of 180 yards two stone drifts are driven from the pits in a north direction, rising ⅛th of an inch per yard. At 300 yards the 90 fathom dyke is crossed; at 600 yards the High Main seam (rising greatly to the north from the dyke) is again reached, and the workings and goaf areas in this seam north of the dyke are very entensive. The drifts are extended further to the Low Main seam=1050 yards, in a direct line from the pits. The downcast pit is divided equally by wood brattice, one-half being the coal shaft and the other half for pumps. The downcast winding-engine is a 40-in. beam condensing engine, 6½-ft. stroke, direct acting, 17-ft. flat-rope drums. Four plain boilers, 20 by 6 ft., under cover, supply steam at 12 lbs. pressure. The engine raises about 350 tons per day in two-decked cages, two 8-cwt. tubs in each cage. About 250 tons is from the lower level, and 100 tons from the Low Main, or 85 fathom level. A similar winding-engine is erected for the upcast pit, which has been used for raising coal; at present it is in reserve for raising men at the upcast, one cage and rope being provided for this purpose. The pumping-engine is a double-acting, non-condensing beam-engine, 51-in. cylinder, 9-ft. stroke; it goes day and night at the rate of five strokes per minute, and raises water from the depth of 191 fathoms. The first and second lifts are each 48 fathoms, 12-in. buckets; these are worked from the outer end of the beam. The third lift is 12½-in., and the fourth, delivering at the surface, is a 13-in. bucket; each lift is about 47½ fathoms: these two are worked by a diagonal rod from the cylinder end of the beam, connected to a 15-in. wood beam, and also to the pump-rods. Six plain boilers, 20 by 6 ft., supply this engine with steam at 32 lbs. pressure. Boilers fed by the large engines, or by an 8-in. cylinder donkey engine.

A hauling engine near the bottom of the upcast has two 20-in. horizontal cylinders, 3-ft. stroke, wheels in ratio of 1 to 1½. Two drums on separate shafts, 6 ft. in diameter, moved by slide carriages; each drum has a clear front. The fly-wheel on the main shaft weighs 4 tons. Two plain boilers, 25 by 5½ ft., fixed about 30 yards from the engine, supply it with steam at 35 lbs. pressure. The boiler fires also serve to heat the upcast column, and, with the escape steam, is the ventilating agent. Quantity of air in circulation, 40,000 cubic feet per minute. The boilers are fed by pressure got from 19 fms. of pipes up the pit, equal to 50 lbs. per inch at the boilers. The engine-plane proceeds 600 yards along the drift, from thence curves round to south-east, and is extended 400 yards further towards the dyke, at an inclination of 4 in. per yard, about half the full dip. Twelve tubs are run at once, worked in and out with tail and main ropes. The pillars are being worked off in this quarter. The coal here is 5½ ft. in thickness, all good, with post roof. Water is given off in considerable quantities on approaching the great dyke. For draining these workings two pumps are fixed. One pump works direct from the shaft of the return wheel, with a double-acting 4-in. plunger, 2-ft. stroke; it is in operation when the engine is hauling. Another pump, with two 8-in. rams, 18-in. stroke, is worked when the engine is not hauling, by passing an additional piece of rope over two wheels, this rope being connected to the main rope by links. The Low Main seam is found at the end of the stone drift, 3 ft. 4 in. thick, with a small band in it, and of the household quality. On the south side of the dyke, where this seam is worked direct from the pit, it produces steam coal, which is the opposite of what generally proves to be the case at collieries further eastward. There are workshops at Gosforth, and one 12-in. horizontal engine, which drives circular saws; and gasworks for lighting the shops, screens and the top of the pit.

SEATON BURN COLLIERY.—This has been 30 years in operation. One pit, 11 ft. in diameter, is divided by brattice, for coal work and pumps; this pit is also the upcast for the colliery. The downcast is a special air-pit, on the Blagdon estate, 1 mile distant. A new pit, intended for an air-pit, is being sunk at Brenkley, 1¼ mile distant. The winding-engine has one 30-in. horizontal cylinder, 5½-ft. stroke, direct-acting, one 13½-ft. cylindrical drum; fly-wheel 30 ft. in diameter, and foot-break; it raises about 600 tons per day, in two-decked cages, two 8-cwt. tubs in each cage, from the depth of 59 fms. The pumping-engine is a double-acting beam-engine, 40-in. cylinder, 6-ft. stroke, with a back lever; it raises water in two lifts; the lower lift is 30 fms., 18-in. bucket, 6-ft. stroke, in the pit: the upper lift is 30 fms., 20-in. bucket, 4½-ft. stroke; this is placed in a staple within the house, and worked from the back lever. The engine goes day and night, at the rate of 8 strokes per minute. Eight plain boilers, 30 ft. by 5 ft., supply these two engines and an engine underground with steam, at 40 lbs. pressure. The colliery being very heavily watered, the underground hauling-engine is at present used as an auxiliary for pumping; this engine has two 16-in. horizontal cylinders, 3-ft. stroke, wheels in ratio of 1 to 2. It is intended to haul with a 6-ft. clip-wheel and endless rope. The engine works direct one double-acting pump, 6-in. plunger, 3-ft. stroke; 8-in. mains are fixed in the pit. The boilers are usually fed by the pumping-engine. There is a boiler-feeder, 6-in. inverted cylinder, 4½-in. ram, which may either be used for this purpose or as a fire-engine.

The Low Main seam ranges from 3 ft. to 4½ ft. in thickness, with moderate roof. The rise is N. 25 W., at the rate of 1½ in. per yard. The cleavage runs both north and south, and east and west, there is also a less distinct cross-cut cleavage. The pillars are made 33 by 16 yards, the bords 6 yards, the walls 8 ft. in width. The pillars are taken off by a jenkin and cross-lifts, chocks being largely used. Little gas is emitted from the coal, and lamps are only partially used in pillar working. An engine-plane, 1 6-10ths mile in length, is made in a north-west direction, with a west branch from it, and is ready to be put into operation when the engine can be applied, as at first designed. The underground conveyance of coal is effected at present by sixteen self-acting inclines, and twenty-eight horses and small ponies.

DINNINGTON WINNING.—Is situated one mile south of Seaton Burn pit. There are two pits, 37 yards apart from their centres, the Augusta pit, 15½ ft., and the West pit, 12 ft. in diameter. The West pit is sunk to the High Main seam, 35 fms. in depth. The present depth of the Augusta pit is 73 fms., being divided by wood brattice; 4½ ft. of this is apportioned for the pumps. The large pumping-engine, designed to drain both Dinnington and Seaton Burn mines, is on the ground; the main beam is constructed of wrought-iron, and will extend from the pumping section of the large shaft to a staple, 7 ft. in diameter, within the house, now nearly sunk to the High Main seam; in which the upper lift of pumps will be placed. The pump-rods will thus be attached to the extreme ends of the beam, with unequal stroke; the rods of the upper lift working close to the side of the steam cylinder. Great care has been taken to obtain good foundation for the massive stone pillars required for the cylinder and beam, the pillars are in course of erection, and are built of Ashlar stone blocks, set with cement. Water in large quantities is usually met with in working the Low Main seam in this district, and this engine is likely to have constant employment in pumping the water from both mines.

The permanent winding-engine for the Augusta pit has two 30-in. horizontal cylinders, 5-ft. stroke, direct-acting; at present it pumps water in two lifts, by means of an eccentric, horizontal rod, and two quadrants. The lower lift is 38 fms., 12-in. bucket, 3-ft. stroke; it is suspended from a ground crab and rope on each side by fivefold blocks. The upper lift is from the High Main, 35 fms., 18-in. bucket, 3-ft. stroke, Five plain boilers, 30 by 5 ft., supply this and two other engines, with steam at 35 lbs. pressure. The boiler feeder has a 7-in. inverted cylinder, 4-in. plunger. The pumping-engine, winding-engine, and boilers were made at the Jarrow Works of Palmer's Shipbuilding and Iron Company. The sinking-engine for the large pit has a 12-in. horizontal cylinder, 2-ft. stroke, wheels in ratio of 1 to 4, one 4-ft. drum. The sinking-engine for the 12-ft. pit is one of Clayton and Shuttleworth's portable class, 6½ in. cylinder, 10-in. stroke, wheels in ratio of 1 to 8½, one 3-ft. drum. The permanent winding-engine is being erected for this pit by Black, Hawthorn, and Co., of two 20-in. horizontal cylinders, 3 ft. 4 in. stroke, direct-acting, cylindrical drum, with two Cornish boilers. The other erections include large shear legs, and a crab-engine; this engine has one 12-in. horizontal cylinder, 2-ft. stroke, it has three pairs of pinion and spur wheels, in ratio of 1 to 4; the second pair is in connection with the jack-drum, giving increase of power 16 to 1; the third pair is in connection with the crab-drum, giving increase of power as 64 to 1. The crab-rope is iron wire, 5-in. circular, the jack-rope is 3 in.

Considerable quantities of water have been encountered in these sinkings, which have been partially dammed back by tubbing: 21 fms. of tubbing is inserted in two lengths below the High Main seam, and 17 fathoms in each pit above it.

KILLINGWORTH RAILWAY runs from Killingworth Colliery to the River Tyne, the shipping staiths being at Wallsend, four miles distant; junction is also effected by other railways from Gosforth and Seaton Burn Collieries. The company are thus enabled to send coals for shipment either to Wallsend or to the North-Eastern system for inland transport. Six locomotive engines and a large stock of chaldron wagons run on the Killingworth lines. One of the old Killingworth locomotive engines is still worked; this ancient "traveller," now called No. 1, has had its worn-out joints repaired by the best portion of the parts of another engine of the same type—the "Atlas"—now laid upon the shelf. These engines, now regarded as curiosities, have two vertical cylinders, 10½-in. diameter, half inserted in the top of the boiler, piston-rod and cross-head above each. From the ends of each cross-head a pair of long connecting-rods reached down to the driving-wheels; they worked economically, but are too light for modern requirements; the last one remaining is only used occasionally.

UNDERGROUND HAULAGE OR ENDLESS ROPE SYSTEM v. COMPRESSED AIR.

SIR,—Your correspondent, "Collier," in the Supplement to the Journal of last week, asks for the opinion of others on this subject. I hope he will not be annoyed at me expressing my views on the matter, which are not precisely in accordance with his. Some three or four years ago a young and intelligent mechanic came to me with a beautifully-made model of a pick coal-cutting machine, which he had made. He said he had had much experience with clip-pulleys and wire-ropes at some steam-plough works, and the idea had occurred to him that a coal-cutting machine might be driven by those means, but he would like my opinion on the matter before taking further steps. The idea looked at the first sight rather feasible, and I thought if it could be adopted would remove one serious obstacle standing in the way of coal-cutting machinery being generally introduced—first cost. We easily got over the difficulty your correspondent points out of moving the machine forward while in the act of cutting the coal, by allowing the endless-rope to pass once round the driving-pulley fixed on the machine, and then being conducted forward to the end of the face or bank about to be cut or holed, before returning to the double clip-pulley; this is all the differential gearing required to permit the forward movement of the machine, as the coal is cut, along the face or bank; but I am afraid it is not the only difficulty to be overcome. There would be the continual removing of the clip-pulleys, or others to be put up, as the machine never works twice in the same line of face; this would be a serious expense, and also the expense in wear and tear of ropes would, I think, be very great; an endless rope for haulage continues to run in the same track, and can be well protected by putting in small pulleys, which could not well be done when working a coal machine, that is, between the machine and the double clip-pulleys, without a great amount of labour.

I considered the young man's proposal well over, and my conclusion was, and is yet, that the most suitable motive-power obtainable is compressed air; and although the first cost is rather large, I believe at the end of a few years' practice with the two the endless-rope system would be found the most expensive, and yet not so effective and useful in other ways, such as increased depths with high temperature, or a ready supply of air in case of emergency, and also the supplying of small jets of air to difficult places, where gas is lodged, that is difficult to remove by bratticing; at present I, therefore, am inclined to give preference to compressed air, believing it to be the best system applicable to the purpose both of working coal-cutters, and in most cases to take the place of the endless-rope system, and the method I would suggest of carrying it out is as follows:—Put down a powerful air-compressing engine on the surface; convey the air down the shaft in suitable pipes, to the several small air-receivers, to be placed in different parts of the mine (none on the surface), fixed in the solid coal, on the sides of the main roads, and all connected and provided with blow-off valves, stop-taps, and gauges. From the most convenient receiver take the supply of air for each coal-cutting machine where it might be at work; and for the haulage of the coals on the main road have a small locomotive engine, which I think there would be no difficulty in making to suit the gauge and roads of our present first-class collieries, provided with a small and suitable boiler, so that the air could be used almost at the same pressure to the end of the supply, then take fresh supplies from the various receivers, or by having taps for that purpose put into the pipes at intervals on the main roads; and small air-pumps might be attached to the locomotive, so that they might pump and compress air while going down inclines, which would also answer for a brake for the engine, and at the same time be creating power to come back with. J. T. M.

Jan. 3.

VEGETABLE CHARCOAL.

SIR,—In answer to the enquiry in the Journal of Dec. 31 respecting the cheapest market for the purchase of Vegetable Charcoal, if your correspondent will call upon me (obtaining my address through your office) I will be prepared to exhibit to him samples of peat charcoal of the highest quality, and will open a negociation for a contract for the supply of 50 tons per week, as named by your correspondent.

London, Jan. 4. SECRETARY.

SUPERSEDING GUNPOWDER IN BLASTING.

SIR,—The opinion very generally prevails that sufficient time has now elapsed since the introduction of the hydraulic coal wedges, for the purpose of rendering unnecessary the use of gunpowder in collieries, to enable practical men to assert with confidence whether the effect produced by them is such as to justify the prohibition of blasting in collieries with gunpowder by legislative enactment, or whether their success is still so equivocal that we must wait for some greater invention before interfering with present arrangements. That blasting in collieries, where explosive gases are known to be given off, is attended with considerable danger is beyond question; yet, even the most experienced and cautious of the Government Inspectors acknowledge that the getting of coal is so greatly facilitated by the use of gunpowder that it would be unwise to prohibit its use, until a really efficient and thorough substitute for it be found; they acknowledge, moreover, that when due care is used in the process of blasting the risk of accident is very materially reduced.

Were the question of the price of coal at the pit's mouth of no moment, there could be no objection to legislation forthwith, for the purpose of replacing the cheaper by the safer mode of getting coal; but inasmuch as the difference of a few pence per ton suffices in some cases to exclude English coal from a market altogether, it is obvious that the utmost caution is necessary. If it were merely the question of the price to be paid by consumers for the coal used for their domestic requirements, an advance of 1s. or so per ton would not be seriously felt; but domestic consumption is small in comparison with the consumption in connection with the carrying on of industrial pursuits, where, in many cases, such an increase in the price of fuel would often convert a profitable into an unprofitable business, and sometimes paralyse the industry altogether. These facts cannot be lost sight of, determining whether we can afford to adopt any legislation calculated to advance the price of fuel; nor is it any answer to state that since all branches of industry would be equally affected, the change would not be prejudicial. Had we to consider our home trade alone, the argument that all classes would retain the same relative advantages as they possess at present would be more tenable, but when it is considered how largely we are dependent upon foreign trade, the case is entirely different; by augmenting the price of coal 2s. per ton, we really give the foreigner an additional premium to compete with us, and thus add to the difficulties of realising profits at present existing.

That which has to be decided, then, is whether the use of gunpowder in collieries can be prohibited without throwing additional labour on the workmen, and thus tending to advance the price of coal to the consumer. To enable this decision to be given, the relative cost per ton of raising coal from the same seam, and under similar conditions, when blasted with gunpowder and when wedged down must be known, and it must likewise be considered whether the coal is in a better marketable condition when wedged than when blasted, for it is obvious that if, by the diminution of the quantity of small made, the number of tons and saleable value of the coal raised be increased, it might happen that the men could be better remunerated when using the wedge than when using powder, and still leave the price of coal to the consumer unaffected. So far as can be judged at present, the hydraulic wedge is the instrument most likely to supersede gunpowder in collieries; and although slight modifications in detail may be necessary to perfect them, there seems reason to anticipate that the principles upon which it is constructed are correct. As the prohibition of blasting would, no doubt, diminish the loss of life among colliers, it is most desirable that the objections to the wedges should be freely urged by the workmen, in order that the defects, if any, should be remedied, and increased safety in colliery working thus secured. R. W. B.

AVOIDING INCONVENIENCE FROM RAILWAY ACCIDENTS

SIR,—Considering the immense number of passengers carried annually by railway, the danger to life and limb is so small that railway officials certainly entitle themselves to full credit for their care and judgment, yet accidents will occasionally occur, and something might still be done to diminish the inconvenience attending them. This inconvenience is felt chiefly upon the metropolitan lines, and more especially when the stoppage occurs near the commencement or close of city business hours, as at that time thousands are endeavouring almost simultaneously to reach or depart from a given point. It is but recently that a slight collision on a metropolitan line, unattended by sacrifice of life, and resulting in the smashing of a single wagon, stopped the entire traffic for about half a dozen miles on each side for nearly half a day, and threw, perhaps, 5000 people upon their own resources for reaching their places of business. It is scarcely to be expected that any stoppage on a metropolitan railway could occur without causing some slight delay, but beyond (say) a quarter of an hour's delay I cannot understand why an ordinary stoppage should cause any serious inconvenience, except to those in the train which actually breaks down.

In the first place, the railway officials must abandon the absurd system of attempting to prevent the occurrence of an accident becoming known, and adopt, instead, a ready method of instantly making known at every station upon their line that an accident has happened. Immediately upon the receipt of information a notice should be posted at each station—"Trains stopped between Portland-road and Gower-street"—or between such other stations as would include the place of the accident. With the exception of the blocked portion of the line, the traffic in each direction should be carried on as usual, the stations on each side of the accident being for the time converted into termini. The traffic on these shortened lines could be conducted as safely as with the whole line in ordinary working order; and as everyone would take his ticket with full knowledge of the stoppage, he could not afterwards complain of the slight delay he would experience in reaching his destination; and in most instances he would gladly accept the diminished accommodation, in preference to suffering the inconvenience he is put to under the present system.

Stoppages are frequently confined to the up-line or to the down-line only, and in those cases the delay need not exceed a few minutes. But for the present we will assume an accident between Portland-road and Gower-street to have stopped both lines. The fact should be at once made known along the line in both directions, and each

up-train as it arrives at Portland-road would be at once emptied of its occupants, shunted on to the down line, and sent back to the place whence it came to bring up a fresh freight. The passengers would willingly walk to Gower-street, where they would find a train from the City shunted on to the up-line ready to take them on to the end of their journey. The delay would be represented by the time occupied in walking from Portland-road to Gower-street, which to many of the passengers would be quite unimportant, and to all would be far preferable to the present system of waiting until the line has been cleared. In the case of an up or a down-line only being blocked the delay and inconvenience would be still less, for the first train arriving on the undamaged line would be retained for the conveyance of passengers between the blocked stations which, as in the former case, would be used as termini. To facilitate the transfer of passengers to and from the up and down-trains as they arrive to the connecting train, a supplementary platform in what is now the "six-foot" could be provided at most stations, so that except to the actual occupants of the disabled train the inconvenience resulting from an accident would be unimportant.—*Jan.* 4. TRAVELLER.

PROTECTION OF INVENTIONS AT EXHIBITIONS.

SIR,—The Act for the Protection of Inventions, 1870, referring to the protection from piracy of inventions exhibited at international and industrial exhibitions, being the final result (through a compromise) of the efforts I made for the same object, as from time to time reported in the *Mining Journal*, I naturally feel interested in making known to inventors and the public the real position in which they are now placed by the operation of that Act.

The Bill prepared by me, some long time ago (an abstract of which appeared in the *Mining Journal*), provided that for the small sum of *one shilling* publicly exhibited inventions might be provisionally registered at the Designs Office, with protection for one year, and the power of extension in extraordinary cases by the Board of Trade for six months more, and should then be capable of being patented or completely registered, as the nature of the case or the law might permit. The draft of my Bill was submitted, in the autumn of 1869, to Mr. Bright, at the Board of Trade, by myself and a deputation composed of gentlemen interested in the success of the then prospective Workmen's International Exhibition, 1870 (afterwards held at the Agricultural Hall, Islington), the Secretary and other members of the Inventors' Institute, and several representatives of important workmen's organisations. Mr. Bright (albeit no friend of the Patent Laws) fully canvassed the question, and promised that something should be done in the matter; but as he shortly afterwards fell into ill health the affair was passed over to the legal secretary of the Board and Mr. Lefevre, M.P., who prepared a Bill by which the usual six months' provisional protection under the Patent Law would have been accorded to exhibiting inventors for *ten shillings*.

This Bill was submitted to the Cabinet, and it is said was opposed by Mr. Lowe, Chancellor of the Exchequer, but was affirmed by that august body. Nevertheless, the Lord Chancellor and the Attorney and Solicitor Generals succeeded in arresting its progress, and myself and the other promoters of the measure had to go again on deputation; this time to the Attorney-General (Sir R. P. Collier), whom we succeeded in convincing that the old law, including the Industrial Exhibitors' Act, 1865, offered no reliable protection to exhibiting inventors (as explained in my pamphlet published in 1865), and he then agreed to bring in a Bill, simply amending the Act of 1865. This Bill, as printed by the Commons, had one or two important defects. Although it allowed six months for appiying for Letters Patent, yet it failed to protect the exhibitor against an adverse publication of the invention by other parties at any time intervening between the closing of the exhibition and the termination of the six months. Further, it was not sufficiently explicit in reserving the right to take out the patent to the exhibitor only (he being the true and first inventor). But upon these defects being pointed out by me to the Attorney-General, he remedied them in the final stages of the Bill. One defect, however, was inherent in the Bill, and could not be remedied—the absence of any system of recording the exact details of invention exhibited, there being no registration allowed or provided for therein, the Patent Office authorities being inimical to anything of the kind.

The effect of this Act is not readily understandable by the non-legal man without the interpretation of a lawyer; its positive effect is the result of the negative enactments of the statute—that is to say,—1. By the ordinary law of patents any public exhibition of an invention before the date of the patent (by whomsoever exhibited) is fatal to the patent right.—2. By the Industrial Exhibitors' Act, 1865, things exhibited at those exhibitions are absolutely exempted from the operation of the ordinary law, hence any person, whether the exhibitor or anybody else, becomes thereby enabled to obtain the grant of Letters Patent, notwithstanding such exhibition.—3. By the new Act (1870), *the exhibitor only* (if "the true and first inventor") is relieved from the operation of the ordinary law, which renders a public exhibition a bar to a future patent, hence *he alone can legally obtain a patent* for the same thing as that which has been already exhibited. With regard to all other persons, the ordinary law against prior public exhibition remains in full force and effect. Such an exhibitor must, however, apply for his patents *within six months from the day of the opening of the exhibition*. The Act also protects the exhibitor (being "the true and first inventor") during six months from being prejudiced by any adverse publication of his invention by other parties without his priority and consent.

The Act also refers to registrable designs, as to which it re-enacts the provisions of the Industrial Exhibition Act, 1865. It refers expressly to the late Workmen's International Exhibition, 1870, and the forthcoming International Exhibition Act, 1871, and its provisions are applicable by the Board of Trade to such future Industrial Exhibitions as that Board may think fit to favour with its certificate.

The great defect is that above alluded to—namely, the want of any registration or recording of a description of exhibited invention; a defect which will enable plagiarists to obtain and hold patents for an exhibited article, because no reliable evidence will be obtainable as to the exact nature and charater of the things exhibited after the models are removed from such exhibition.

The public will have no efficient means of protecting itself against the assumptions of pseudo inventors, who are merely copyists of things exhibited at exhibitions, because the evidence of such exhibitions will not be obtainable.

Again, the want of this evidence will place a stumbling-block in the way of every inventor who has not been the exhibitor of the same article as he patents, because if any apparently similar thing has been exhibited under the Act, unless he has himself seen it at the Exhibition, he will have no way of satisfying himself as to whether he has not been anticipated by something previously exhibited.

Probably this difficulty may be to some extent removed if each exhibitor keeps a certified registry of descriptions of new inventions exhibited thereat; and with the view that this may be carried out as regards the forthcoming Exhibition of 1871, I have written to the authorities of that undertaking on the subject.

Gray's Inn, Jan. 3. F. W. CAMPIN.

COPPER MINES AS THE BEST INVESTMENT DURING THE PRESENT YEAR.

SIR,—The consumption of copper for many years has been gradually on the increase, although the price for that article has been ruinous to the majority of the once celebrated, but now worn out, mines throughout the world. One extreme invariably produces another in the market price of every article. The price of copper for some years was extremely high. The majority of the richest mines were wrought at very high pressure, and fabulous profits made in Cornwall and Devon, as well as in Australia, Chili, and many other countries, but mines, like men, will not last for ever. Mines paying from 20,000*l.* to 40,000*l.* per annum are so far exhausted that even were the price of copper to advance 40 per cent. higher than at present, these old mines can rarely ever pay to work again. To expend 1*l.* 1s. to get 15s. is a poor speculation. Such has, too frequently, been the case in working very deep mines.

With respect to copper, when the centre or meridian of a deposit is passed, the percentage of the bunch, technically termed, is invariably gone through, and the mine is on the wane; but if there are parallel lodes, the case may differ, as every lode may yield a fresh mine. Such has been the case in most of the great copper-producing districts in Cornwall. For some years past the royalty or dues crippled all enterprise in Cornwall, but recently the owners of the soil have found it to their advantage to act on more liberal terms, consequently, investors will do well to turn their attention to mining in Cornwall, where machinery and materials can be purchased at half the price charged a few years ago.—*Jan.* 3. A. BENNETT.

THE TIN TRADE, AND ITS PROSPECTS.

SIR,—The profits obtained during the past year by the holders of shares in the mines of Cornwall and Devon have been so satisfactory, upon the whole, that it may fairly be anticipated that many capitalists will be disposed to invest in our mines, in order to procure a share of the dividends to be declared during the current year. And if we wish to maintain the credit of the two counties we should endeavour to let every investor get a fair return for his money. Of course, each must decide for himself which particular mine he will invest in, because the choice will depend so much upon circumstances—the amount of money at disposal, the necessity for immediate returns, and the facilities possessed for taking advantage of any rise or fall in the market price of shares being among the number—but we may at least consider what class of mines are likely to be most reliable during the next twelve months. The stability of a mine, as we all know, depends on the stability of the metal it produces; and, as far as Cornwall and Devonshire are concerned, tin and copper are the only metals of which we need take notice. Of these I am decidedly inclined to give the preference to tin, although I am quite aware that copper has of late much improved in position.

The statistics of the tin trade, I think, quite justify my preference for that metal. In the year 1866 the import of Banca tin to Holland (for I should observe that it is the position of the Banca tin trade which to a very great extent influences prices here) was about the same as the stock at the end—in fact, on Dec. 30, 1866, there still remained 4000 slabs of 1865 tin in addition to the whole of the 1866 imports on hand, the aggregate stock at the date mentioned being 195,643 slabs, though the total import for the year was but 191,869 slabs. This, of course, may be accounted for by the panic of May, 1866, but still it represents tin in its worst position. For the last four years the improvement has been steady, though not rapid—perhaps the best kind of improvement that could take place to promise permanency. The shock of 1866 did much to stop both imports and sales, but more especially the latter, so that at the end of 1867 there was a stock of 186,677 slabs, although the imports were but 111,542 slabs. The following year (1868) showed an important revival in the trade, for although the imports increased to 113,060 slabs, the total stock was reduced by the end of the year to 142,014 slabs. This improvement was still further developed in 1869, which closed with a total stock of only 123,648 slabs, although the imports had increased to 125,939 slabs. And, lastly, we have 1870, which was decidedly the most prosperous year since 1864. The imports in 1870 increased by more than 50,000 slabs; the increase in stock at the close of it was less than 30,000, the figures being—imports, 176,146 slabs; total stock at close of year, 150,979 slabs.

Such a position as this, and with English block tin at 134*l.* per ton, must be regarded as highly encouraging for the Cornish and Devon tin mines, for there is reason to hope that prices will be well maintained, seeing that there has been great steadiness during the year, although it is notorious that, perhaps with the sole exception of Messrs. Bolitho, all dealers in English tin had speculated too largely for a fall instead of a rise, the consequence being that almost every metal broker in London was using every means, both fair and unfair, at his disposal to force prices down. It is upon these grounds that I anticipate an improvement in the value of almost every description of Cornish and Devon tin stock during the year; and as the profits on tin will enable much of the copper to be worked with advantage, we may hope that we are entering upon a year of prosperity for— ONE AND ALL.

WEST MARIA AND FORTESCUE.

SIR,—It is somewhat singular, if my statements in regard to these mines were so "one-sided and incorrect," as Capt. Skewis states in his letter of Dec. 29, that the first letter I received on the subject after the publication of my Notes was from one of the *lessees of the mine*. This gentleman thanked me for what I had written, and added, "It is almost to the very letter of my advice to the committee and shareholders in Glasgow, which, however, they seemed to have rejected." I may add further, that the holders of nearly 4000 shares have expressed themselves in the same way, and offered me their co-operation and support. I maintain, moreover, notwithstanding the denial of Capt. Skewis, that my statements will be found substantially correct. Mr. Willesford has from the first been ready to settle the dispute in a fair and friendly spirit, but his legal *right* has been denied, and this, I presume, is what he has refused to have arbitrated. I have always understood—in fact, never heard the question disputed before—that if stuff from one lord's land is brought up through another's shaft an acknowledgment is paid for it. Had this been conceded at West Maria it would have entailed a cost, probably, of 5*l.* or 10*l.* per month. By denying the lord's right, and getting involved into a Chancery suit, the property has been depeciated 20,000*l.* in value. I may add it was my desire to see Capt. Skewis, but when at the mine I heard he was in Scotland.

J. Y. WATSON.

WEST MARIA AND FORTESCUE CONSOLS.

SIR,—I observe an article in the Journal of Saturday last regarding this mine, and, lest the interests of any shareholders might be prejudiced, I think it right to ask you to insert this letter. First, I would enquire how the writer of the article, if he really wished reliable information as to the result, did not write to the office of the company, where the papers connected with such a matter were likely to be, in place of going to the mine, where he saw the resident agent, whose duties, I had thought, were confined to its practical working? As it is, he has made statements, some of which, while they have a semblance to the facts, are so expressed as to lead to an erroneous impression, while others are quite incorrect. It would almost appear the article was written in Mr. Willesford's interests, but for the mention that the writer is a shareholder. I could easily go over in detail and place every statement in a different light, but I refrain from doing so in a public journal. I am always ready to give every information to shareholders, without their writing to newspapers. The writer of the article may be well able to give a correct opinion when in possession of all the facts of the case. In this instance, however, he has not been furnished with these, and this will be best shown by stating that the cautious Scotch were cautious enough to get the best independent legal advice it was possible to obtain before they took any steps; and, so far as the case has gone, the Vice-Chancellor has decided in our favour. JOHN E. WATSON, Purser.

Renfield-street, Gasgow, Dec. 29.

P.S.—Owing to absence from home, the foregoing was not sent on in time for last week's publication, and I have since seen in the subsequent Journal a note that several shareholders have written to Mr. J. Y. Watson. I would respectfully suggest to the shareholders, in place of writing to other parties, or allowing themselves to be led into any course of action, they should satisfy themselves from *reliable* sources what the real facts of the case are, as I can assure them they are very different from what they have been made to appear.

"PRINCE OF WALES"—"QUEEN."

SIR,—There is one feature in connection with the management of the "Prince of Wales" which forcibly strikes any observant shareholder. It appears that both silver and tin have been existing in good paying proportions in some at least of the lodes, but the managers were either too sleepy or too stupid to see either. Neither resident agent or visiting agent was able to make the discovery, and it was not until the active managers of the "Queen" (and particularly their valuable officer, Capt. Knott) had demonstrated to the mining world the existence of those metals in large quantities in the adjoining mine that the Prince of Wales authorities began to rub their half-open eyes in astonishment, and dimly to see how long and how deeply they had been napping. Have the managers been growing old? Are their faculties dimmed with easy living or with age? We want younger men in these times—men with sensitive perception and force of will—men with scientific knowledge at command—to meet the requirements of English mining, and to enable it to compete with that of more rich and favoured countries. I, for one, throwing aside the dictates of petty jealousy, heartily congratulate the "Queen" company on its possession of these essentials, and the new impetus it is undoubtedly imparting to English mining.

I see that the "Queen" amalgamist states in his report to the company (made at the recent meeting) that "from ore containing 16 ozs. of silver to the ton he has succeeded in extracting 14 ozs., or ⅞ths." If this is a fact (and there seems no reason to doubt it) the future of the "Queen" is secured by this alone, as the utilisation of the poorer class ores is the main point in connection with the silver question. The supply of the poorer class ore is practically unlimited, and the amalgamist further states that all the ores in the sett contain silver—*i.e.*, not only the silver lode proper, but also the copper and tin lodes, and in such quantities as will pay well under the new process for its extraction.

As the two mines are contiguous, and have the same lodes, what applies to the one would seem to apply to the other; and although the "Queen" company claim to have the best of the lodes (which they contend increase in value until they run into the "King," still further east, where they expect to find the junction), yet it sufficiently evident that in silver and in tin the Prince of Wales has two additional valuable sources of revenue; and, letting bygones be bygones, I will only further express a hope that these sources will be developed to the utmost, and so compensate the shareholders for past neglect.

PRINCE OF WALES.

EAST WHEAL LOVELL.

SIR,—I was once a shareholder in this mine, but considered it wisdom to sell out, for reasons that I will now state. If I have been in error, I think it is the duty of Capt. Quentrall to clear up the dark points alluded to for the sake of the shareholders. In the statement of accounts furnished to the shareholders for April 7, there is—By black tin from Jan. 7 to April 6, three months, 73 tons 2 cwts. 1 qr. 2 lbs.; value, 5362*l.* 8s. 11d.—July 4: Statement of accounts—Black tin sold from March 31 to June 25, three months, 59 tons 19 cwts. 1 qr. 2 lbs.; value, 5075*l.* 10s. 1d.—Nov. 16: Statement of accounts—Black tin sold from July 24 to November 15, nearly four months, 71 tons 7 cwts. 3 qrs. 7 lbs.; value, 5373*l.* 9s. 10d.—thus clearly showing a falling off in quantity of tin produced, as the three months ending April 7 produced 73 tons 2 cwts. 1 qr. 2 lbs.; the four months ending Nov. 16, or nearly four months, only produced 71 tons 7 cwts. 3 qrs. 7 lbs.—thus proving a great falling off in quantity of tin raised.

The purser states this falling off to be owing to the great drought. Allowing this, how does it happen that such mines as Tincroft and Wheal Jane were not affected in the same way? I cannot see how the dry weather could prevent tin-stuff being raised to surface; it would account for it not being dressed. All mines that wish to keep well with their shareholders should publish monthly returns of metal sent to market. We have in the *Mining Journal* a monthly return of tin for South Condurrow and Pedn-an-drea, also Van, Tankerville, and other mines do the same. Why cannot East Lovell? It looks as if there was a great falling off in quantity of tin raised. "A word to the wise is sufficient for them." I think shareholders would do well to read the report in the Journal of Nov. 26, on East Wheal Lovell, by Capt. W. Pascoe (of South Frances), and again of Dec. 24 by the same gentleman.—*Dec.* 31. OBSERVER.

EAST WHEAL LOVELL, AND CAPT. WILLIAM PASCOE.

SIR,—If it be true that history repeats itself, it is more unvaryingly true that the shares in East Lovell considerably advance in market value immediately Capt. W. Pascoe issues one of his lugubrious reports. I mentioned in one of my communications that it has more than once happened the effect of an unfavourable report from this agent has been an almost simultaneous advance in the price of shares from 23*l.* to 33*l.*, or 34*l.*; but when I penned that statement little did I think that the fact was about to be so quickly and completely repeated. What do I find?—that Capt. Pascoe was present at the last mid-monthly inspection, and, of course, wrote a discouraging report, the shares at the time being at about 23*l.* to 24*l.*; but, as fate would have it, before that report appeared in your columns the price had advanced to 33*l.* or 34*l.* If, instead of a *bona fide* shareholder, I were a mere speculator for a rise in these shares, it would be my most devout wish that Capt. Pascoe should inspect the mine, feeling perfectly sure that the more discouraging his report, the more certain and profitable would be my operation. "'Tis strange, but 'tis most true."

Helston, Jan. 2. ONE BEHIND THE SCENES.

GREAT WHEAL LOVELL.

SIR,—The notice which appeared in last week's Journal respecting the discovery at this mine is only just sufficient to raise hopes which may ultimately prove most delusive. As a shareholder, I cannot refrain from saying that if the discovery is of the important character indicated, our manager should have forwarded some official notification of it to the Journal, by which we should have been able to form some more accurate idea of its value. I am sure it would be of great interest to all shareholders to know at what depth and under what conditions the lode now cut in Great Lovell became so productive in East Lovell, and also any further information with regard to the ore-bearing strata of the district. For instance, I should like to know at what depth East Lovell began to be profitable, also Trumpet Consols, and whether the rock formation of Great Lovell in any way resembles that of those productive mines. Possibly I may be met by the statement that we cannot expect our manager to afford such information, but surely in an exceptional case like this, where so many shares have been taken upon the assumption that the East Lovell lode would be cut sooner or later, it is not too much to expect that some such facts as those I above indicated should be communicated.—*Liverpool, Jan.* 2. A SHAREHOLDER.

EAST CARN BREA MINE, AND ITS MANAGEMENT.

SIR,—I have been waiting anxiously for some time past to see whether the committee of this mine are not going to change the management. When I saw in the Journal that Capt. Richards's services were required no longer, in consequence of the poverty of the mine, I thought that Capt. Pryor, the resident agent, would be appointed to superintend the management, but I was doomed to disappointment, as well as several residents of this neighbourhood. I have known Capt. Pryor ever since he has been in the neighbourhood. First, as agent under Capt. Richards, at South Carn Brea, where he discharged his duties well; and I am certain that since he has been at East Carn Brea he has worked very hard, and especially when they are dropping pitwork in Thomas's shaft, being up both day and night. As a miner, I believe Capt. Pryor to be thoroughly competent, and I find by men who have worked under him that he is especially well informed in the management of pitwork. I have heard several say that Capt. Pryor knows where to drive and intersect the lodes of the mine, and would make it pay with a small outlay. It is generally supposed that the mine is worthy of a trial, but what can they do with a dozen or fifteen men, who, like children, are digging pits in the sea-sand? Why do not the adventurers work the mine in a miner-like manner, and I feel confident that they would meet with success? In conclusion, I would point out to the adventurers the desirability of extending a cross-cut from Buckley's shaft to intersect the Bucket's lode, and of sinking Thomas's engine-shaft. OBSERVER.

Redruth, Jan. 3.

WEST CARADON MINING COMPANY.

SIR,—I beg, through the medium of the Journal, to draw the attention of the West Caradon adventurers to an error which appears to me to have occurred in the balance-sheet issued to them on March 18. In the statement of accounts presented at the meeting, held on Nov. 18, 1869, the debit balance brought down to the end of September is 1255*l.* 10s. 1d., to which is added as a supplement the October cost-sheet, 662*l.* 3s. 10d., making 1917*l.* 13s. 11d. In the "profit and loss" account, March 18, 1870, this debit balance, 1917*l.* 13s. 11d. (which includes the October cost-sheet), is brought from last account; to this is added one year's income tax, 37*l.* 7s. 6d., and the loss on the current four months' working to end of January last, which again includes the October cost. The debit balance brought down should have been 1255*l.* 10s. 1d., instead of 1917*l.* 13s. 11d. The adventurers evidently seem to have paid the October 1869 cost twice over. How such an error escaped notice at the meetings held in March and July seems unaccountable. Who are the company's auditors?

Dec. 29. A FORMER ADVENTURER IN WEST CARADON.

PACIFIC MINING COMPANY.

As a shareholder in this company, I perused with considerable interest the letter from "A Nevadian," which appeared in the Supplement to last week's Journal. If the statements your correspondent makes be founded on fact, I think as shareholders we have some ground of complaint against our Chairman for not having imparted at least some of the encouraging information to us at the recent meeting. Had he done so I and, no doubt, many others would not have sold many of our shares for what they would realise. The Chairman's address was without a gleam of hope, whereas (according to "A Nevadian") our Lander Hill Mine is really a property of great promise. I cannot agree, however, with your correspondent with regard to the action of the directors in the matter of the Union Hill Mine, for it appears to me they acted most wisely and prudently in suspending operations until some evidence had been gained, by the development of the surrounding mines, as to the productiveness or otherwise of the quartz in depth. If it should be determined to resume the development of this mine no injury, I take it, can have arisen from this temporary suspension of operations. My chief object, however, in trespassing upon your space is to impress upon our committee the absolute necessity of embodying in their report the *whole* of the data they have been able to obtain, and allow us to judge for ourselves as to the position and prospects of our company.

Jan. 3. A SHAREHOLDER.

MINING IN NEVADA.

SIR,—In February of last year I offered to an English company a property in Nevada, known as Bateman's Eureka, or Buckeye and Champion Mines, producing what is known as crude bullion, for the sum of 50,000*l.* The provisional company that was formed to purchase and work the same was called the Champion Mining Company. They sent out Capt. Frank Evans from Wales, on whose report the purchase was to be confirmed or rejected. He was accompanied in the examination by Capt. Brown, of the Pacific Company's Mine, in Austin, and this latter unfortunate person condemned, with Capt. Evans, the property as a failure. A Californian company immediately bought the property, and their shares are now selling in the San Francisco market at a total of 150,000*l.*, or 200 per cent. profit on the price asked; the profits making are almost at this rate per annum. The following extract from a local paper will prove this:—

"The Eureka Consolidated Company, under the able management of Mr. J. F. Boyd, is turning out bullion in quantity and quality that will, in figures, be far ahead of any furnace in the Union. The complete re-lining of the three furnaces and placing the fan in a central position, with the enlarged facilities for reducing ores, will enable them to run until Spring without detention, and give a net result of 10 tons daily during all the time they run. Everything goes on like clock-work about the furnace and the mine, and the new furnace, built under direction of C. von Liebenau, is the most perfect success of any one now in use in the State. The workings of the furnaces under the present management are models, and well worthy the attention of any person wishing to engage in the business. For the month of October, and there were some days lost time in the running of the furnaces, there was produced 22½ tons of bullion, of which the average assay in gold and silver was a few cents over $300 per ton, and the lead is worth $120 per ton in San Francisco. Thus making for the month of October an aggregate that will equal the product of many quartz mills, which would be run at much greater expense than the furnaces have been. The cost of ore delivered at the furnace, for mining and hauling, does not exceed $3 per ton. The ore used by this company is exclusively from the Champion and Buckeye mines of the company, and the regular average of bullion is accounted for in the fact that no experiments are tried. The company from the two mines can get more ore than they can work, and with only 12 hands 40 tons per day can be produced. Of this ore 3½ tons will make a ton of bullion, which is a smaller quantity of ore than of any other that is now regularly worked, or that has been discovered in large quantities. Until the 17th of October the bullion made by this company has been sent to Newark, New Jersey. Since that time it has been shipped to Selby & Co., at San Francisco, for separation. For the last 28 days, up to the 15th, the company has paid to teamsters for transportation to the railroad $4348·60, at prices varying from $ 4 to $17 per ton. On a capital stock of $5,000,000, this company, under its present management, will be able to make the largest dividends of any company on the Pacific Coast."

I trouble you with this statement, as whole districts are so often injured in reputation from the sad mistakes made by so-called practical men.

Palmerston-buildings, Old Broad-street. J. E. BOWE.

[For remainder of Original Correspondence see to-day's Journal.]

GEOLOGICAL SOCIETY OF LONDON.

December 21: JOSEPH PRESTWICH, F.R.S. (President), in the chair.

Valentine D. Colchester, Buckland Villas, Belsize Park; H. J. Heighton, Gold-street, Kettering; Thomas Hawksley, Great George-street, Westminster; Frank Rutley, of the Geological Survey of England, Jermyn-street; Isaac Roberts, Rock Park, Rockferry, Cheshire; Rchd. Glascott Symes, of the Geological Survey of Ireland, Victoria-terrace, Ballina, County Mayo, and Hume-street, Dublin; and Daniel Pidgeon, F.R.M.S., Banbury, were elected Fellows of the Society.

The following communications were read:—1. "On Lower Tertiary Deposits Recently Exposed at Portsmouth;" by C. J. A. Meyer, F.G.S. —2. "Note on some New Crustaceans from the Lower Eocene of Portsmouth, collected by C. J. A. Meyer, F.G.S.;" by H. Woodward, F.G.S. —3. "On the Chalk of the Cliffs from Seaford to Eastbourne, Sussex;" by W. Whitaker, B.A., F.G.S.—4. "On the Chalk of the Southern Part of Dorset and Devon;" by W. Whitaker, B.A., F.G.S.

THE SUPPLY OF COAL IN SOUTH STAFFORDSHIRE.

The South Midland Institute of Mining, Civil, and Mechanical Engineers monthly meeting of members was held in their rooms, at the Exchange, Wolverhampton, on Monday, Mr. J. P. BAKER, the Government Inspector of Mines for the district, was in the chair as President of the Institute. There were also present—Mr. H. Beckett, F.G.S., past President; Mr. James Cope, F.G.S., Mr. Silas Bowkley, F.G.S., Mr. Daniel Jones, F.G.S., Mr. T. Rose, Mr. Thomas Walker, Mr. John Spittle, Mr. H. H. Beckett, and others.

Mr. Jones was nominated as an honorary member; and Mr. Wm. Griffiths, of Coseley; Mr. James Perry, of Rowley; Mr. Henry Tolley, of Walsall; together with Mr. H. Willcock and Mr. Jas. Butler, of Wolverhampton, were elected ordinary members. On the proposition of the President, Mr. Hooper (Mayor of Tamworth) was nominated as an ordinary member, and Mr. Daniel Jones as a honorary member, their election to take place at the next meeting. The President then called upon Mr. Jones to read his second paper on "The Sulphur Springs of Chillington and Codsall Wood."

Mr. DANIEL JONES, before commencing his subject, took the opportunity to thank the members present for the honour they had proposed to confer upon him, assuring them that he had no ambition of that kind in view in contributing the papers he had written, his only object being to advance the cause in which they were all engaged—to elicit information for the better understanding of those phenomena and scientific appearances which present themselves in relation to mining pursuits. Mr. Jones then proceeded to read his paper, which, he said, was intended to supply additional information in relation to these sulphur springs, and explain certain facts which he did not enter into in his first paper. He commenced by quoting an extract given by Dr. Plot, in his "Natural History of Staffordshire," of the sulphur well at Codsall Wood, pointing out that Dr. Plot spoke of only one such spring, while they knew of three such springs. This was followed by a quotation from Milner's "Gallery of Nature," on the origin of sulphur springs; and Mr. Jones then, by the aid of a diagram which he had prepared, explained his theory of the origin of the sulphur springs in question. His belief was that at the point where the spring issued forth there was a fault or slip in the underlying beds of New Red Sandstone, Permians, and coal measures. Then came the question, How this sulphuretted water made its way to the surface without being impregnated with the other water around it, which was known to be pure and free from all trace of sulphur? His theory on this point was that the water of which these sulphur springs was ultimately formed was collected from the rainfall on the surface of the ground about four miles to the east of the springs, at a point where the coal measures formed an outcrop in junction with the Permians. Then the water, so collected, gradually percolated down in a slanting direction on the surface of the coal measures, which, containing, as he supposed, a large proportion of pyrites, gave to the water its sulphuretted character. Flowing on in this way it was prevented ascending to its natural level by the impervious character of the overlying upper Permian strata, until, reaching the fault before mentioned, the water forced its way up by the side of the slip to the surface. That its sulphuretted character was not lost by impregnation with the other water collected between the two points he had mentioned was, no doubt, due to the fact that the impervious belt of upper Permians which prevented the sulphuretted water from ascending also prevented the volume of water collected within the New Red Sandstone measure from descending. That the sulphuretted water did not come from the alluvium, or drift, was evident from the fact that the water from the neighbouring pumps and wells was entirely free from sulphur. That it did not come from the Red Sandstone was evidenced by the fact that at Cosford, about four miles to the west of the Chillington springs, the Wolverhampton Corporation Waterworks Company had bored an artesian well, 265 feet deep, of a diameter of 10 inches at the top and 7 inches at the bottom, from which 250,000 gallons of water per day were obtained, without any traces of sulphuretted hydrogen.

Hence they gathered that the stratum pierced by the bore-hole (probably the upper portion of the Bunter sandstone) was saturated with water gathered from the surrounding neighbourhood, and to such an extent that it has been observed by residents in the neighbourhood that the flow of water in some of the smaller brook courses of the neighbourhood were sensibly affected. The quantity of water, however, flowing from the Codsall Wood and Chillington springs was a mere trickling as compared with the rushing volume at Cosford, and this, he thought, was another evidence in support of the theory he put forward. Another instance was supplied by the results of an artesian well sunk in the sandstone at Goldthorn Hill, and the water was also pure, and they all knew that if they wanted pure water sink a well in the New Red Sandstone. Again, without quoting numerous instances in other parts of the world, there are to be found in Admaston, Shropshire, two springs—one a sulphur and the other a saline spring, which showed that such separate and distinct flows of water through strata impregnated with water of opposite characters went a great way to confirm the explanation he had given for the remarkable phenomena to which their attention had been directed. In "Plimley's Survey of Shropshire" was a description of a sulphuretted spring, occurring at Sutton, near Shrewsbury, known as Sutton Spa, but the spring yielded only a scanty stream. In its neighbourhood were several beds of soft limestone and coal, and the coal was mixed with so large a proportion of pyrites, or sulphurate of iron, as to be used only for inferior purposes. Of such a nature was the outcropping of coal to which he held that the Chillington and Codsall Wood springs owed their origin. In the Shropshire case they had the outcropping of the coal measures of the Shrewsbury coal field, the limestone lying at about 13 yards above the Yard coal, and that coal was so pyritous as to have earned the name of suphur coal all over the district. The coal measures indicated were of the younger age, like those at Newent, in Gloucestershire, where Sir Roderick Murchison had found sulphur springs, as described in the first paper.

Mr. Jones concluded his subject with a description of the chemical action by which sulphurate of iron, iron pyrites, or "martial pyrites," as it was sometimes called by old writers, were decomposed, and which brought about that spontaneous combustion in coal measures of which we sometimes heard. The conclusion he had drawn was—although he only put it forward as a theory, and by no means as an established fact—that sulphur springs were not due to any local causes, but were caused by water collected at some given point, and then percolating through strata of coal, and were, therefore, to be regarded as indications of the existence of coal measures. This being his opinion, he fully believed that the coal field of the Cannock Chase district would be found extending beneath Chillington and Codsall Wood, as well as other places not yet pointed out upon the Geological Survey Maps.

On the proposition of the PRESIDENT, a very hearty vote of thanks was accorded to Mr. Jones for his highly interesting and valuable paper. The President said the geological phenomena of the sulphur springs at Chillington and Codsall Wood were certainly involved in a deal of mystery. As to his own views, they remained as before. They were that the springs could not have originated with the measures of the Cannock Chase and Wyrley district, for they were cut off by red marls, and he was singularly confirmed by the paper Mr. Jones had just read. Whether that was so or not, Mr. Jones's theory, if it were correct, went far to establish the existence of coal many miles to the west of that which was supposed to be the western boundary fault of the South Staffordshire coal field. It could not be regarded, however, as an established fact that the existence of these sulphur springs was a sure indication of coal measures; in fact, the opinion he (Mr. Baker) before expressed that the springs might be due to local causes had not been disproved.

Several other members agreed with this, and after a brief discussion the proceedings terminated.

APPARATUS FOR TREATING COPPER PYRITES.

Mr. C. M. TESSIE-DU-MOTAY, of Paris, the eminent French chemist, has just completed a new process for the treatment of the sulphuretted minerals of copper, commonly called pyrites. The process comprises an entire change in the operations at present in use for the roasting of these minerals, which is performed when the mineral is in a state of fusion by means of air or oxygen, which at the same time produces a mechanical stirring of the materials, which are held in an apparatus specially arranged for this operation, the apparatus being shown in the accompanying engravings. After being reduced to the melted state in a cupola, H, the melted mineral is led through a tube or passage, I, into the roasting and stirring apparatus. This apparatus is chiefly composed of two chambers or capacities, A A1, communicating with one another by a conduit, B. A number of pipes, *c c c*, lead into the midst of the melted metal contained in the chambers, and in the conduit jets of air or oxygen, and, if necessary, simultaneously mixed jets of air and combustible gases. Orifices, D D1, are formed at the top of each of the chambers to permit the escape of the gases, which can be closed alternately, and passages, E E1, at the upper part of each of the two capacities, A and A1, leading air under pressure regulated by cocks permit the production of a pressure upon the melted mass, sometimes on one side and sometimes on the other, which forces it through the conduit, B, uniting them into one or the other of the capacities alternately. This alternate backward and forward movement thus causes a regular mechanical stirring, in which the movement imparted to the mass, as well as the differences in density of the different portions of the melted mass, act concurrently, in order to produce an intimate mixture, and to facilitate the chemical reactions produced by the air, the oxygen, or gases. The outflow is effected through an aperture, F, at the lowest part of the conduit, B, uniting the two capacities.

FIG. 1.

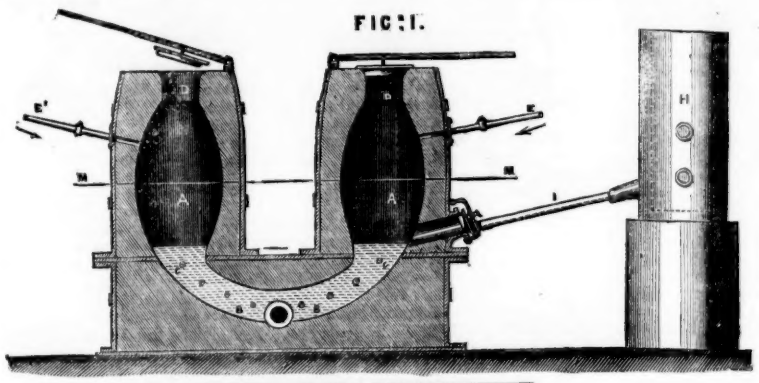
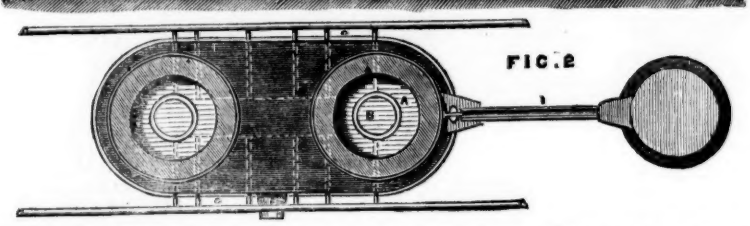


FIG. 2



The matt thus obtained is again melted in a cupola, then re-roasted in the same apparatus; and these operations are repeated as many times as found necessary. An addition of silica is also employed in convenient quantities, according to the nature of the mineral, in order to scorify the oxide of iron produced during the roasting process. Matts very rich in copper are thus obtained, and it is only necessary now to reduce and refine them.—*Mechanics' Magazine.*

FOREIGN MINING AND METALLURGY.

Cold weather has given a great stimulus to the demand for domestic qualities of coal in Belgium; but, on the other hand, it has singularly interfered with deliveries. These can only be made by railway; and, climatic obstacles apart, the supply of rolling stock is sadly deficient. Advices from the Belgian coal mining centres indicate a sustained demand on the part of Germany and Holland. The Belle-et-Bonne Colliery Company, at Jemmapes, is paying its dividend for the first half of 1870, or 12s. per share. The Charleroi United Collieries Company is paying a dividend of 10s. per share for 1870, and also half-yearly obligation interest. The Bonne Esperance and Batterie Colliery Company, at Liége, is paying a first dividend for 1870 of 1*l.* per share.

Pig in Belgium is disposed of as readily as it is made, and there are scarcely any stocks. The rolling mills are generally less well off for work, no new orders of any importance being reported. The period of the year can scarcely be pronounced, however, a favourable one; it is the time of stock-taking, when affairs are generally in a languishing state. At present industrials have not very much to complain of, and they have profited from the absence of pressing orders, so as to prepare to profit from the revival in business which is expected to follow the cessation of hostilities. The Luxembourg question still disturbs forgemasters, who ask, "Is their security at all reliable?" It is hoped, nevertheless, that Prussia will think twice before decreeing measures which will be prejudicial to local metallurgical industry. The Grivegnée Company has been authorised to add to its ironworks ten puddling-furnaces, a pile hammer of 15-horse power, a horizontal steam-engine of 20-horse power, and sundry other appliances.

Very little commercial information now comes to hand from France. It appears, however, that at the last dates Toka copper was quoted at Marseilles at 80*l.* per ton; refined Chilian and Peruvian at 78*l.* per ton; red copper in sheets at 80*l.* per ton. In Germany, the number of transactions in copper continues comparatively limited; this must be attributed to the season of the year, and to the difficulty attending all transports. At Rotterdam, Russian has made 51 fls., and Drontheim 50 fls. to 52 fls. The German tin markets present a favourable appearance; at Berlin, the demand has been maintained, and transactions have been rather more numerous. At Rotterdam there have not been any very great transactions in tin; Banca is quoted at 76½ fls.; Billiton is scarce, and cannot be purchased below 76 fls. Advices from Batavia state that the quantity offered at the last bi-monthly sale of Billiton was about 6000 piculs. At Marseilles lead in saumons, first fusion, has made 18*l.* 16s.; ditto, second fusion, 17*l.* 8s.; and rolled and in pipes, 20*l.* 16s. per ton. On the German markets lead has experienced no change. At Rotterdam, Stolberg and Eschweiler have made 11 fls.; ditto, various German marks, 10¾ fls. Upon the German markets there is scarcely anything passing in zinc; stocks are considerable, and increasing.

It will be interesting to examine the financial position of Russia, as upon the course of Russian finance will probably depend the future prosecution of Russian railway enterprise—at any rate, of guaranteed Russian railway enterprise. It appears that, according to the estimates which have been prepared for 1871, the probable receipts of the Russian treasury for the year are set down at 475,093,437 roubles, and the probable outgoings are given at 491,782,589 roubles. The estimates show that the receipts are considered to be increasing. The probable augmentation of revenue in 1871 over 1870 is calculated at about 4,000,000 roubles, while the increase in the expenses will not, it is estimated, exceed 2,770,000 roubles. It is obvious, however, that all these conjectures and calculations will not count for much if Russia engages in any great conflict. That Russia is intensely military already will be seen by the fact that she proposes to expend 154,590,000 roubles for naval and military purposes. We have been at the pains to go into these details because Russia has supplied of late such a valuable contingent of orders for railway iron to the British iron trade.

The latest advices from Charleroi state that contracts for coal which have been entered into for the first six months of 1871 have been concluded upon the same footing as those made in September, 1870, which are now nearly run out.

The Belgians are rather proud, and justly so, that all the mechanical apparatus for the piercing of the Mont Cenis Tunnel has been furnished by the Company John Cockerill, of Seraing, in Belgium.

SULPHURIC ACID.—By the invention of Mr. R. OXLAND, Plymouth, the arrangement of burners or calciners may be such as is usually adopted; the gases pass off into flues, and in the case of the presence of arsenic in the ore the flues are made of sufficient length to allow of the condensation in them of the arsenious acid evolved. The gases are led into a close vessel containing nitric acid, and are caused to pass through the acid and thence into the upper part of the vessel, where they mix with low-pressure steam; they pass on to a second vessel, in which they pass through sulphuric acid, and thence in like manner they pass through a series of three or more vessels containing sulphuric acid of different strengths, the last of the series being the strongest, or over 1·70 specific gravity.

FOREIGN MINES.

ST. JOHN DEL REY.—The directors have received per Sindh the following report, dated Morro Velho, Nov. 29:—Morro Velho produce, second division of November, eleven days, 3176 oits.; yield, 2·365 oits. per ton.

D ON PEDRO.—F. S. Symons, Nov. 29: Produce weighed to date, 6391 oits.; estimate for month, 7591 oits.—Mine: The lode in Alice's west continues to give more encouraging samples than heretofore, and some box work (not very rich) has been taken out; that from other parts of the mine of low standard; quantity from stopes in canoa limited, owing to water, and not very auriferous. In the commencement of the month a small portion from curve was broken. The water has increased in Vivian's shaft, and impeded sinking, but as a communication to Treloar's has been holed, in a few days the machine will be relieved by water having its exit through this, in lieu of Alice's. The sinking is prosecuted, and a cross-cut commenced to drain the bottom of the mine. The re-opening of Treloar's, where driven through flookan, and the tunnelling of the middle adit, are progressing satisfactorily.

ANGLO-BRAZILIAN.—F. S. Symons, Nov. 29: General operations are progressing with regularity, but from the appearance of the stamps samples of stone appear to be poorer than usual. Little alteration in size of lodes and quantity of pyrites disseminated throughout. At Dawson's the lode is more jointy, consequently the duty per borer is less.

GENERAL BRAZILIAN.—Thomas Treloar, Nov. 28: General Operations: I have nothing important to advise by this opportunity as to the general operations. On the whole, all is going on well. The weather has been wet and stormy, and sickness is slightly on the increase. At St. Anna the old adit has presented no change, but at the shallow adit we have had to strengthen the timber work by putting sets of timber between those previously in. At Itabira the shallow adit is also without change, but at the middle adit the progress has been retarded by a hard bar of ground. Cleaning regos has been suspended, because the weather is unfavourable to such work. Surface hands are concentrated on buildings, and preparing accommodation for force, which is coming in very satisfactorily, is receiving now primary attention.

TAQUARIL (Gold).—T. S. Treloar, November 28: The stamps were christened on Nov. 19 "Mangles," and successfully set in motion on that date, since when trial stamping has been going on. All works connected with the same, and with the reducing canoas, strakes, temporary wash-house, &c., are drawing to a close, and on 1st prox. permanent stamping of auriferous matter will be commenced. The erection of a new dwelling house for Europeans is on hand, but the weather is now extremely wet and unfavourable for out-door operations. Quarrying stuff for the stamps is being prosecuted vigorously. The bottom of the old shaft is still covered with water, but we are daily expecting the thorough drainage of this part of the mine by intersection of the footwall lode in Haymen's shaft. The deep adit continues in manganese, and excellent duty is being done.

ROSSA GRANDE.—Ernest Hilcke, Nov. 28: Mina da Serra: Since my last communication surveys have been made for sinking Dale's shaft from surface, and we have commenced with the rising of this shaft from adit level. At the 40 fm. level west the lode continues of good size, but it is considerably fluctuating in the 50 fm. level, and in the stopes below same, and the stone is not yielding so favourable as last month.—Cachoetra Mine: Little has been done here, as only a very small force could be spared for working this mine.

ECLIPSE (Gold).—The directors have received the following report for November from Capt. Barratt:—General Operations: Since my last respecting progress the main shaft is sunk 46 ft. below the 160 ft. level; lode increased to 8 ft. wide, carrying 4 ft. wide of auriferous ore of good quality. The lode in the main shaft being in close proximity with the cross-course is generally a little more or less mixed with various rocks, and in the last fortnight we have broken some very rich argentiferous galena and antimonial silver ore from the south end of the main shaft, and in that portion of the cross-course we are obliged to carry down with us. This cross-course has not shown mineral before the last week or two, and now it is highly mineralised, and we have auriferous ore in the north and south lode (Eclipse lode), and in the cross-course, bearing about east and west, we have silver ore of exceedingly good quality. I have prepared some samples for assay; when done I shall report more fully on the silver discovery. Our new staff are engaged stoping in the back of the 100 ft. level; lode 8 ft. wide—4 to 6 ft. wide of it is yielding good milling ore. The engine and stamps are almost erected. We shall immediately put in our tables, with other necessary fixtures, and I hope be at work stamping by the end of this month. I send you a section of the Eclipse Mine workings.

EXCHEQUER (Gold and Silver).—Lewis Chalmers, Dec. 5: During the week ending Dec. 3 the main tunnel was driven 4 feet, the rock being very hard; I expect to find good ore at the back of this belt of hard rock. The shift at the 50, from winze, made 4 ft., and put in three sets of timbers. The shift stoping from the 80 took out seven car loads (12,000 lbs.) of second-class ore, and about 500 lbs. of first. The windlass shift raised 352 buckets of water, and 67 loads of dirt and ore. At the mill, lumber for the mine is being turned out at the rate of 8000 to 9000 ft. per day; with an edging saw we should do 12,000 ft. The engine is now in first-rate order, and does its work well. The repairs and alterations here have run away with so much money that my expenditure for the past month will appear rather heavy. I shall have to pay out some $3000 for quicksilver, salt, and a retort furnace before I can start the stamps. The teams are hauling timber to the mine daily on sleighs returning with ore. Snow very deep, and earlier than usual. I intend, if the storm does not stop the teams (it did two days), to get down as much ore as possible, and run it through. The mine is A 1. In stoping up from the 80 to supply the teams, I expect to strike good ore a little higher up; we spotted it while sinking.

LUSITANIAN.—Dec. 20: At Taylor's engine-shaft the lode is worth 1½ ton of ore per fathom. At the 140, east of Taylor's, the lode is 1½ ft. wide, composed of schisto and strings of ore. At the 140, west of Taylor's, the lode is 6 ft. wide, composed of quartz. At the 130 east the lode is 1½ ft. wide, composed of schisto. In the 130 west the lode is 4 ft. wide, worth 1½ ton per fathom. At the 120 east the lode is 2 ft. wide, with a branch of ore worth 1 ton per fathom. At the 110, east of River shaft, the lode is 8 ft. wide, very loose. At the adit, west of Perez', the lode is 1 ft. wide, composed of quartz and stones of ore. At the 8 the lode is 6 in. wide, composed of soft country, with a well defined south wall. At the 28 west the lode is 6 in. wide, unproductive. At the 28 east the lode is 6 in. wide, composed of quartz and stones of ore. At the 28, west of slide lode, there are good stones of ore. At the 38, east of Taylor's, the lode is 1 ft. wide, composed of quartz and country. In winze No. 82, east of River shaft, the lode is 2½ ft. wide, composed of quartz. In the rise above the 90 the lode is 6 ft. wide, worth ½ ton of ore per fathom. In winze No. 84, below the adit, west of Perez', the lode is 1 ft. wide, worth ¼ ton per fathom.—Carvalhal: In the winze on the north lode the lode is 2½ ft. wide, composed of quartz, &c. At the 60, on great lode, the lode appears to be in small bunches. At the 50 east the lode is worth 1 ton per fathom. At the 40 east the lode is 1½ ft. wide, composed of quartz and spots of lead. At the 30 east the lode is 2 ft. wide, composed of quartz and lead, worth ½ ton per fathom. At the 20 east the lode is 1 ft. wide, composed of quartz.

[For remainder of Foreign Mines see to-day's Journal.]

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